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FLORISTIC STUDIES IN INDIA—PRESENT STATUS AND FUTURE STRATEGIES WITH SPECIAL REFERENCE TO BIHAR

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INTRODUCTION AND PHYSIOGRAPHY

The State of Bihar lies between 23° 48′ and 27° 31′ North latitude and 83° 21′ and 88° 32′ East longitude. It has an area of about 1,72000 sq. km., out of which about 80,000 sq. km, area is covered by Gangetic alluvium in the northern part and about 92,000 sq. km is occupied by hard rock in the south. The State extends from the foot of the Himalayas in the north to the hill ranges on the border of Orissa in the south, part of Uttar Pradesh and Madhya Pradesh in the west and West Bengal in the east. The north and the south can be physiographically divided into two broad divisions viz (a) the Gangetic plains of north Bihar, with a fringe of the Himalayan foothills and the Terai region in the extreme north west and (b) the Chotanagpur plateau region of partly central and south Bihar. This plateau represents a vast area from the western most part of Bihar to the border of West Bengal in the east and continues further into West Bengal. This plateau can be physiographically divided into the Ranchi and Hazaribagh plateaus.

The entire State has been divided by the mighty river Ganga into two regions—the north and the south. The central portion forms the gangetic belt. In the north other rivers join Ganga, the most important ones are Sone and Kosi which are well known as "Rivers of Sorrow" because every year they inundate huge areas of land, thus rendering many people homeless and causing severe damage to the crops. In south Bihar the important rivers are Damodar and the Barakar, which carry a stupendous amount of flood water during the rainy season. A number of streams have their sources on plateau top and they flow in different directions. The Subarnarekha flows to the east, the south Koel in the west and, the Damodar in the north. Apart from these many water falls like the Hundru falls on the Subarnarekha and Johna falls add to the scenic beauty of the eastern part of the plateau. On these river systems four dams namely Tilaiya, Maithon, Panchet and Tenughat have been constructed which not only produce hydel power but also provide irrigation

GEOLOGY AND SOIL

The soil in the gangetic plains of north Bihar and some portions south of the Ganga mainly consists of alluvial deposits and the Chotanagpur plateau of south Bihar represents a red soil type formed on the rocks belonging to the pre-cambrian age consisting of Singhbhum granite, Chotanagpur gneiss with associated metasediments like mica-schists, phyllites and quartzites

CLIMATE

The climate of the state in general is of the monsoon type with the monsoonic months confined to July-September. The average annual rainfall is about 140 cm with the maximum downpour during July-August. The hottest months of the year are May-June with mean maximum temperature of 42° C and the coldest months are December-January with mean minimum temperature of 12° C.

HISTORY OF BOTANICAL EXPLORATIONS

The history of Botany of Bihar is more than a century old. The first explorer or plant collector in the series was J. D. Hooker who in the year 1848 ascended the Parasnath hills and made large collections of plants. Edgeworth also botanised on Parasnath hills. Thomson in September 1858 made collections from the hills and revisited along with Anderson in November 1858. Ball (1869) collected plants from Manbhum and made significant notes of the flora. Subsequently the vegetation of the state was studied by Clarke, Buchanan-Hamilton, Kurz, Campbell, Gamble, Wood and Prain. To the specimens and data collected by the earlier explorers and plant collectors H. H. Haines (1921-25) added his own collections and findings and brought out a comprehensive account of the plant wealth of the state under the title "The Botany of Bihar and Orissa" This work of Haines has been further supplemented by H. F. Mooney (1950) and A. Sanyal (1957). Other interested workers of different universities, colleges, research institutes and several individuals also contributed towards the knowledge of the flora of Bihar (Howard & Khan 1922; Biswas 1934, 1935; Biswas & Sampathkumaran 1949; Ghosh 1938; Srivastava 1951, 1954, 1955, 1956, 1958, 1959, 1961, 1964; Ara 1954, 1960, 1966; Roy 1956; Sinha 1957, Bharadwaj 1958; Paul 1966, 1967; Shah 1968; Azam et al. 1969; Misra 1969, 1970, 1971; Misra & Agarwal 1969; Misra & Jha 1972 and Maheshwari & Pandey 1973).

The Botanical Survey of India after its re-organisation in the year 1954, has taken up exploration work in several parts of our country for systematic evaluation of the flora. However, only a few botanical explorations have so far been conducted in this State until recently. Mukerjee (1956) recorded some additions to the flora of the Parasnath hills. Panigrahi (1966) visited Rajmahal hills and collected many plants, out of which 9 species and 1 genus appeared to be as new record for Bihar. Verma (1961, 1963) made some studies on the grassland communities. Thothathri *et al.* (1966), recorded *Arnebia hispidissima* DC. in Udaipur forests in Champaran district as a new record for Bihar state. Kanodia & Malick (1966) also made some new records of plants from South Bihar. Banerjee & Banerjee (1968) gave an account of the flora of Udaipur forest of Champaran district, in North Bihar. Mazumdar & Biswas (1971) studied the vegetation of Chaibasa. During the preceeding year some areas of South Bihar was explored by Banerjee (1976) and during the months of July-August 1977, the author himself has explored many areas of south Bihar in the districts of Singhbhum, Ranchi and Palamau and made preliminary observations on the flora and vegetation of these areas. It is therefore suggested that an intensive as well as extensive explorations should be conducted in order to assess the present vegetable wealth, as gradually large number of industrial complexes are coming up and mining operations are going on specially in south Bihar causing damage to many valuable species of medicinal, economic and taxonomic value.

VEGETATION

The vegetation of the state can be broadly classified into 5 types :

(a) Evergreen forests, (b) Dry deciduous forests, (c) Thorny-scrub forests, (d)

Waste land vegetation, (e) Aquatic vegetation.

Haines (1921-25) has given an extensive account of the vegetation of the composite area of the present States of Bihar and Orissa. In this paper, a brief account of the vegetation of the Bihar state confirming to the present political boundaries, is described on the basis of the earlier published accounts and also on the author's own field observations made during the botanical explorations, especially in south Bihar

(a) *Evergreen forests* : These forests are noticeable along the eastern side of the Sareyaman lake in Champaran and northern Purneah districts in north Bihar and Hazaribagh (Parasnath hills) and Singhbhum districts in south Bihar. The characteristic features of this type is the predominance of evergreen tree species although a few deciduous trees and shrubs may also occur as exceptions particularly along the outer margins of the forests. The common tree species met with are *Dillenia pentagyna, Shorea robusta, Stephania hernandifolia, Macaranga peltata, Bischofia javanica, Streblus asper, Elaeocarpus serratus, Litsaea salicifolia, Micromelum pubescens, Terminalia tomentosa* and *Ficus nervosa.* Some of the striking species such as *Gnetum scandens, Uvaria hamiltonii, Meliosma simplicifolia* and *Cyclostemon assamicus* known to occur in Saranda division of Singhbhum district are the characteristic elements of the lower Himalayas. *Syzygium cumini* is often seen along the water courses. Some of the common shrubs and undershrubs are *Glochidion lanceolarium, Homonoia riparia, Melanthesa rhamnoides, Flemingia stricta, Colebrookia oppositifolia, Coffea bengalensis* and *Murraya exotica.* The common herbs and the climbers noticeable are *Ageratum conyzoides, Justicia betonica, Polygonum plebe jum, Sida veronicifolia, Pouzolzia indica* and *Curculigo recurvata* and *Entada scandens, Bauhinia vahli, Butea* sp. and *Dioscorea* sp. *Epiphytic* flora is represented by orchids like *Vanda tessellata, Pholidota articulata* and Species of *Cymbidium.* The common ferns are species of *Tectaria, Lygodium and Nephrodium.*

(b) *Dry deciduous forests* : This type of forests occupy considerably longer areas and are met with in parts of Champaran district in north Bihar, Rajmahal hills, Ranchi and Palamau districts of south Bihar. *Shorea robusta* forms a principal tree species growing as pure quiescence where re-generation has been noticed from its Coppices. The other common trees are *Mallotus philippensis, Streblus asper, Mitragyna parvifolia, Tectona grandis, Diospyros melonoxylon, Bridelia stipularis, Cassia fistula, Lagerstroemia parviflora, Emblica officinalis, Terminalia arjuna, Madhuca longifolia* and *Spondias pinnata.* The shrubby undergrowth found in the forest constitutes species like *Colebrookea oppositifolia, Callicarpa macrophylla, Mimosa rubicaulis, Helicteres isora, Flemingia chappar, Nyctanthes arbor-tristis, Symplocos racemosa* and *Antidesma diandrum* etc. The ground flora is generally poor and grasses are also not abundantly seen unless the canopy is open. Some of the common ones are *Centaurium roxburghii, Hemigraphis hirta, Justicia diffusa, Barleria* sp. and *Vernonia* sp. Climbers are represented by *Clematis gouriana, Butea parviflora, Mucuna prurita, Combretum roxburghii, Abrus precatorius* and *Dioscorea* sp. *Vanda tessellata* and *Luisia* sp. are the common epiphytes.

Species of *Selaginella, Adiantum* are seen in wet, shady and rocky crevices.

(c) *Thorny-scrub forest* : This type of vegetation is often seen in southern Bihar especially in Bhagalpur and Gaya districts. It is characterised by stunted and sparsely growing thorny bushes. The common plants are *Acacia concinna, Caesalpinia bonduc,* *Ziziphus mauritiana*, *Capparis sepiaria*, *Flacourtia ramontchi* and *Aegle marmelos*. Amongst the undershrubs *Elephantopus scaber*, *Barleria cristata*, *Sida acuta* and *Andrographis paniculata* are often seen.

(d) *Waste land vegetation* : Some of the representatives of this type of lands are *Cassia occidentalis*, *C. tora*, *Sida rhombifolia*, *Dodonaea viscosa*, *Calotropis gigantea*, *Vitex negundo*, *Argemone mexicana* and *Stachytarpheta indica*. In south Bihar in Ranchi & Palamau districts the fibre yielding *Agave sisalana* has been planted by the forest department for employment to the tribals for the manufacture of rope under the rural development programme.

(e) *Aquatic vegetation* : In both north and south Bihar regions there are a good number of lakes, ponds and other water reservoirs which are rich in aquatic vegetation of which the large Pawapuri Lake in Nalanda district has become a famous tourist spot and abounds in very beautiful species of *Nymphaeas*. Other common aquatic plants are *Hydrilla verticillata*, *Marsilea minuta*, *Smithia sensitiva*, *Vallisneria spiralis*, *Lindernia anagalis* and *Trapa bispinosa*. In many ditches the common weed *Eichhornia crassipes* has been found growing gregariously.

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